FIG. 1

Input picture → Picture memory (101)

Picture memory (101) → (−) (110)

(−) (110) → Prediction residual encoding unit (102)

Prediction residual encoding unit (102) → Bit stream generation unit (103)

Bit stream generation unit (103) → Bit stream

Prediction residual encoding unit (102) → Prediction residual decoding unit (104)

Prediction residual decoding unit (104) → (+) (111)

(+) (111) → Deblocking unit (105)

Deblocking unit (105) → Picture memory (106)

Encoding mode controlling unit (107)

Intra prediction image generation unit (109)

Inter prediction image generation unit (108)

112

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FIG. 2

Bit stream → **Bit stream analyzing unit** 201 → **Prediction residual decoding unit** 202 → (+) 208 → **Deblocking unit** 203 → **Picture memory** 204 → Output picture

209 switch

Intra prediction image generation unit 207

Inter prediction image generation unit 206

Decoding mode controlling unit 205

FIG. 3A

Block boundary

Pixel in adjacent block   Pixel in target block
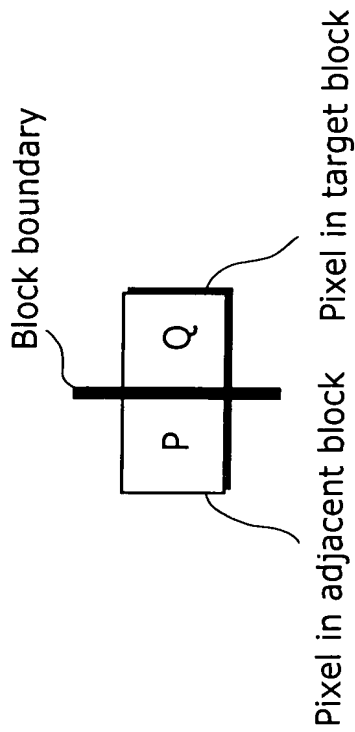
FIG. 3B

Filter 4	In the case where a boundary is at vertical edge and either P or Q belongs to block which is intra prediction encoded.
Filter 3	In the case where a boundary is at horizontal edge and either P or Q belongs to a block which is intra prediction encoded.
Filter 2	In the case where either P or Q belongs to a block having coefficient other than 0.
Filter 1	In the case where P and Q belong to a block which is inter prediction encoded and refer to respective pictures, or refer using respective motion vectors.
Filter 0	Other than the above.

FIG. 4

```
                    ┌─────────┐
                    │  START  │
                    └─────────┘
                         │
                         ▼                        ⌒F1
    ┌────────────────────────────────────────────┐
    │  Number of pixels adjacent to              │
    │  a boundary (luminance signal)             │
    └────────────────────────────────────────────┘
                         │
                         ▼                        ⌒F2
    ┌────────────────────────────────────────────┐
    │           Determine filter type            │───────┐
    └────────────────────────────────────────────┘       │
                         │                                │
                         ▼                        ⌒F3     │
    ┌────────────────────────────────────────────┐       │
    │              Apply filter                   │       │
    └────────────────────────────────────────────┘       │
                         │                                │
                         ▼                        ⌒F4     │
    ┌────────────────────────────────────────────┐       │
    │  End the number of pixels adjacent          │       │
    │  to the boundary (luminance signal)         │       │
    └────────────────────────────────────────────┘       │          ⌒F5
                         │                      ┌──────────▼──────────────┐
                         ▼              ⌒F6     │  Filter type            │
    ┌────────────────────────────────┐         │  corresponding          │
    │  Number of pixels adjacent to a│         │  to a pixel position    │
    │  boundary (chrominance signal) │         │  of luminance           │
    └────────────────────────────────┘         └─────────────────────────┘
                         │
                         ▼                        ⌒F7
    ┌────────────────────────────────────────────┐
    │              $X_L = 2 \times X_C$           │
    │              $Y_L = 2 \times Y_C$           │
    └────────────────────────────────────────────┘
                         │
                         ▼                        ⌒F8
    ┌────────────────────────────────────────────┐
    │           Determine filter type            │───────┘
    └────────────────────────────────────────────┘
                         │
                         ▼                        ⌒F9
    ┌────────────────────────────────────────────┐
    │              Apply filter                   │
    └────────────────────────────────────────────┘
                         │
                         ▼                        ⌒F10
    ┌────────────────────────────────────────────┐
    │  End the number of pixels adjacent to       │
    │  the boundary (chrominance signal)          │
    └────────────────────────────────────────────┘
                         │
                         ▼
                    ┌─────────┐
                    │   END   │
                    └─────────┘
```
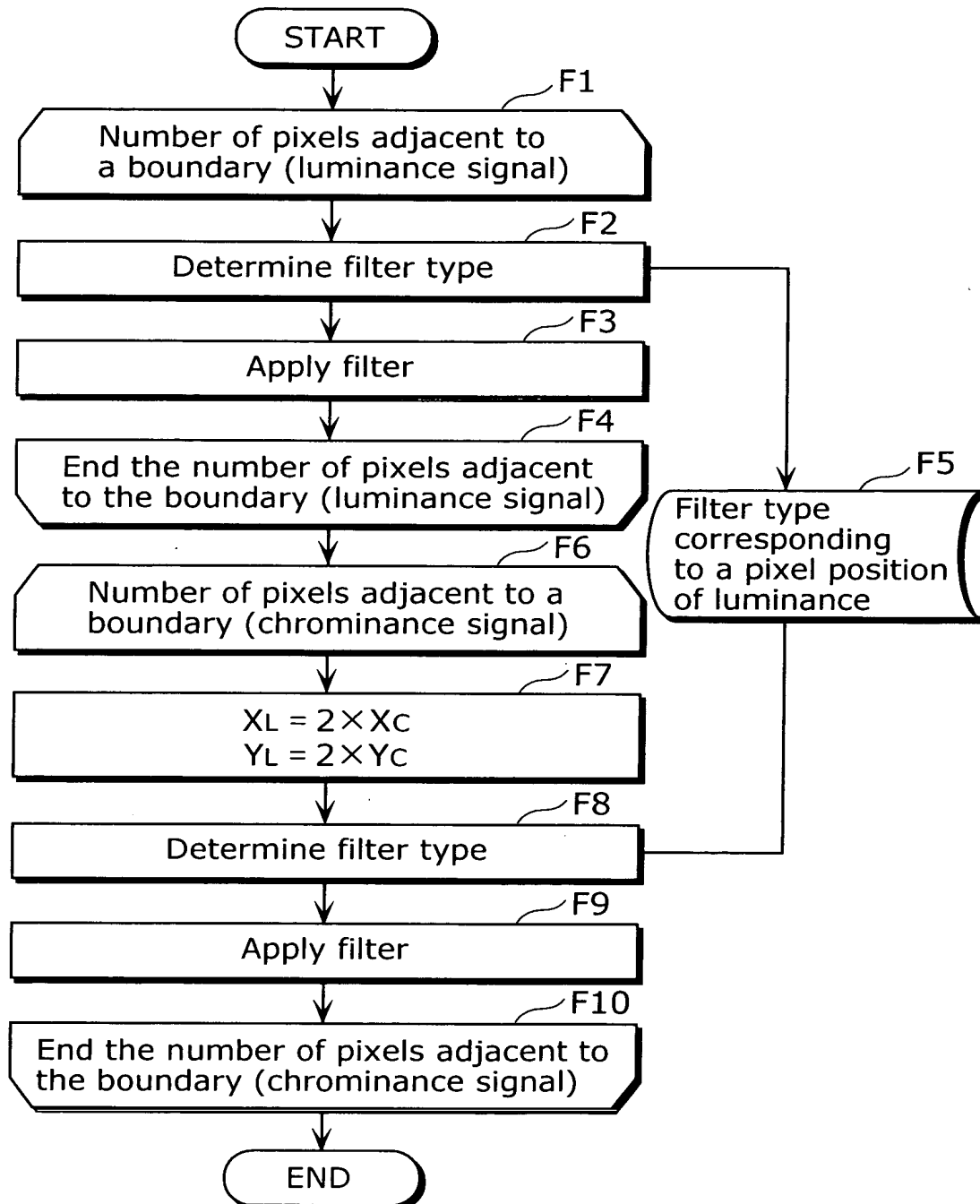
FIG. 5A

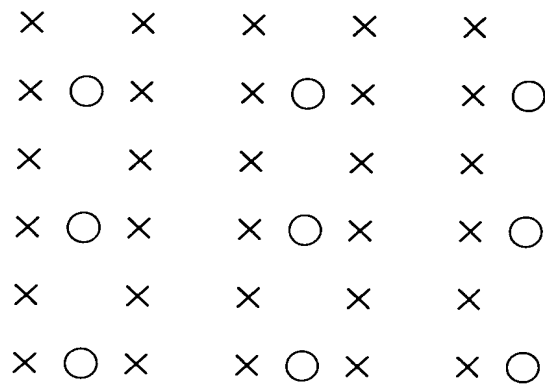Half decimation in horizontal and vertical directions
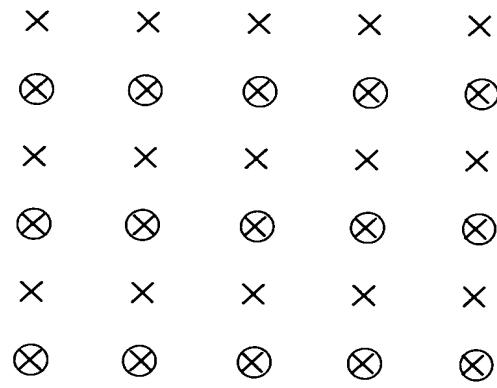
FIG. 5B

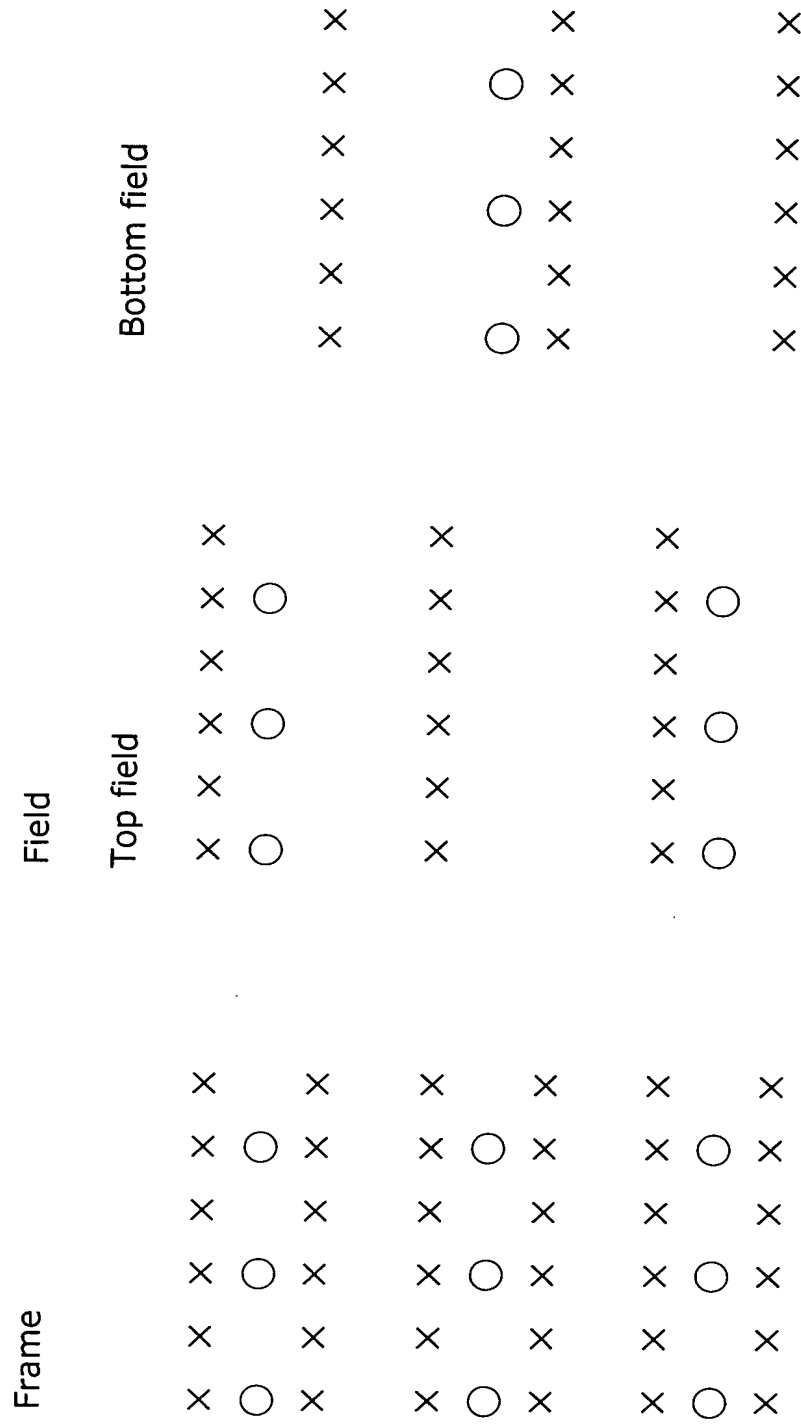Half decimation in horizontal direction

FIG. 5C

No decimation

× : Luminance component sample position

○ : Chrominance component sample position

FIG. 6A

Frame

× × × × × ×

× ○ × × ○ × × ○ ×

× × × × × ×

× ○ × × ○ × × ○ ×

× × × × × ×

× ○ × × ○ × × ○ ×

FIG. 6B

Field

Top field

× × × × × ×

× × ○ × × × ○

× × × × × ×

× × ○ × × × ○

Bottom field

× × × × ×

× × × ○ × ×

× × × × ×

× × × ○ × ×

× × × × ×

× : Luminance component sample position

○ : Chrominance component sample position

FIG. 7A

FIG. 7B

× : Luminance component sample position
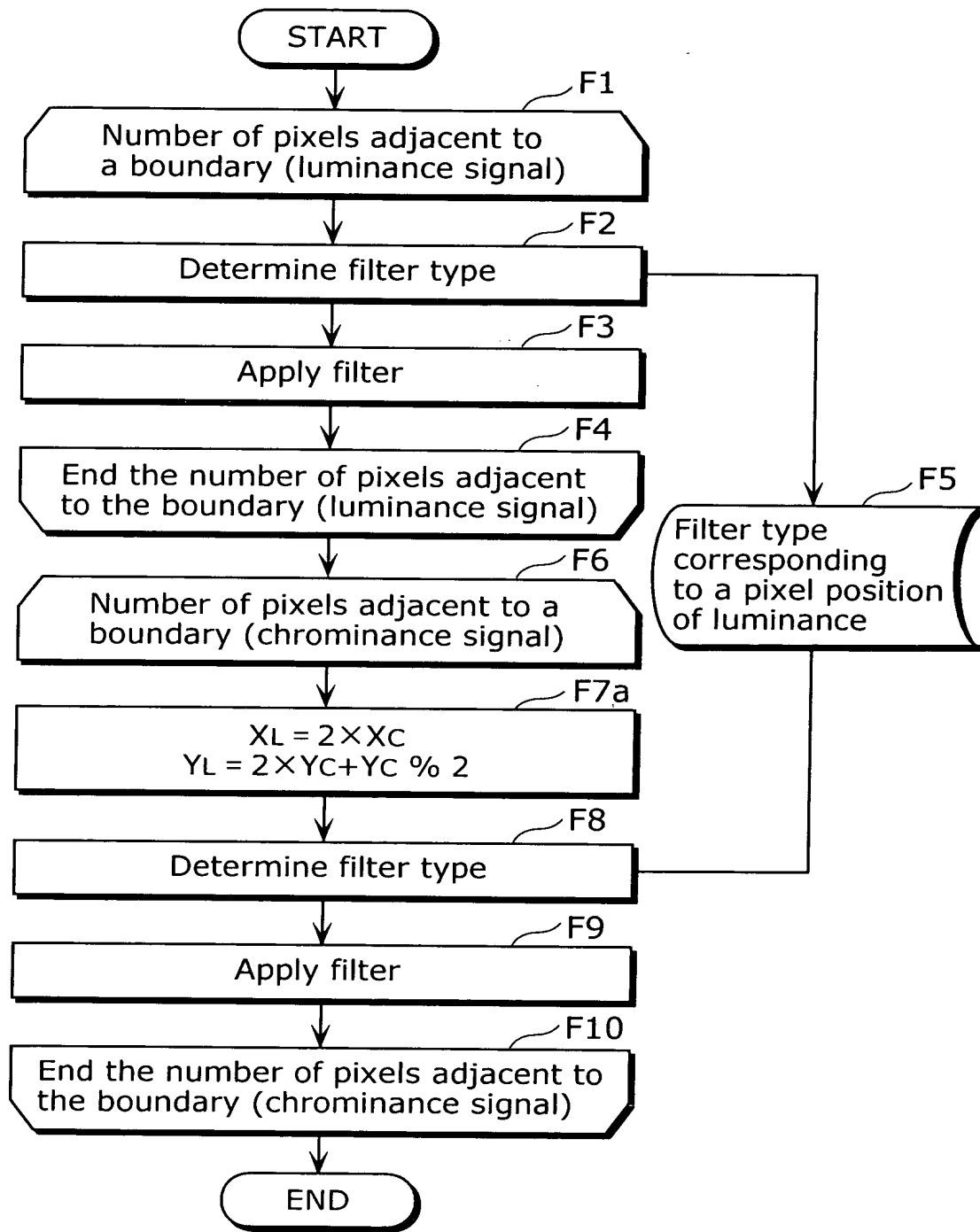
○ : Chrominance component sample position

FIG. 8

START

Number of pixels adjacent to
a boundary (luminance signal)   F1

Determine filter type   F2

Apply filter   F3

End the number of pixels adjacent
to the boundary (luminance signal)   F4

Filter type
corresponding
to a pixel position
of luminance   F5

Number of pixels adjacent to a
boundary (chrominance signal)   F6

$$XL = 2 \times XC$$
$$YL = 2 \times YC + YC \% 2$$ F7a

Determine filter type   F8

Apply filter   F9

End the number of pixels adjacent to
the boundary (chrominance signal)   F10

END

FIG. 9A

Frame

L_0 → × × × × × ×
C_0 → ○ ○ ○

C_1 → ○ ⇢ × × × ○ ⇢ ×
L_3 → × × × × × ×

L_4 → × × × × × ×
C_2 → ○ ○ ○

FIG. 9B

Field

Top field

L_0 → × × × ×
C_0 → ○ ○ ○

× × × ×

L_4 → × × × ×
C_2 → ○ ○ ○

Bottom field

× × × ×

C_1 → ○ ⇢ ○ ⇢ ○ ⇢
L_3 → × × × × × ×

× × × ×

× : Luminance component sample position

○ : Chrominance component sample position

FIG. 10A

START

F1 — Number of pixels adjacent to a boundary (luminance signal)

F2 — Determine filter type

F3 — Apply filter

F4 — End the number of pixels adjacent to the boundary (luminance signal)

F6 — Number of pixels adjacent to a boundary (chrominance signal)

F5 — Filter type corresponding to a pixel position of luminance

F7b — $XL = 2 \times Xc$ $YL = YC$

F8 — Determine filter type

F9 — Apply filter

F10 — End the number of pixels adjacent to th boundary (chrominance signal)

END

FIG. 10B

START

F1 — Number of pixels adjacent to a boundary (luminance signal)

F2 — Determine filter type

F3 — Apply filter

F4 — End the number of pixels adjacent to the boundary (luminance signal)

F6 — Number of pixels adjacent to a boundary (chrominance signal)

F5 — Filter type corresponding to a pixel position of luminance

F7c — $XL = Xc$ $YL = YC$

F8 — Determine filter type

F9 — Apply filter

F10 — End the number of pixels adjacent to th boundary (chrominance signal)

END

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FIG. 11A

Frame

L_0,C_0 →

L_1,C_1 →

FIG. 11B

Field

Top field

Bottom field

L_0,C_0→

L_1,C_1→

× : Luminance component sample position

○ : Chrominance component sample position

FIG. 12A

Frame

$L\_0,C\_0 \rightarrow$ ⊗ ⊗ ⊗ ⊗ ⊗ ⊗

$L\_1,C\_1 \rightarrow$ ⊗ ⊗ ⊗ ⊗ ⊗ ⊗

FIG. 12B

Field

Top field

Bottom field

$L\_0,C\_0 \rightarrow$ ⊗ ⊗ ⊗ ⊗

$L\_1,C\_1 \rightarrow$ ⊗ ⊗ ⊗ ⊗

× : Luminance component sample position

○ : Chrominance component sample position

FIG. 13A

Se

Tr

FD

FIG. 13B

F

FD

FIG. 13C

Cs

FDD

F

FIG. 14

Camera ex116

Computer ex111

LSI ex117

PDA ex112

Camera ex113

Cell phone ex115

ex107

ex108

ex109

ex110

Cell phone ex114

ex100

Telephone network ex104

Internet service provider ex102

Streaming server ex103

Internet ex101

FIG. 15

ex201

ex208

ex202

ex203

ex204

ex206

ex207

SD

1 2 3
4 5 6
7 8 9
* 0 #

manner

ex205

ex115

FIG. 16

ex313

Power supply circuit unit — ex310 → To each unit

Main control unit — ex311

Operation input control unit — ex304 ← Operation keys — ex204

Image encoding unit — ex312

Camera I/F unit — ex303 ← Camera unit — ex203

ex115

LCD control unit — ex302 → Display unit — ex202

Image decoding unit — ex309

Multiplex/demultiplex unit — ex308

Record/reproduce unit — ex307 ↔ Recording media — ex207

Modem circuit unit — ex306 ↔ Communication circuit unit — ex301

Voice processing unit — ex305

Voice input unit — ex205

Voice output unit — ex208

ex201

FIG. 17

Monitor ex404

Reproduction device ex403

ex402

Antenna ex411

Car ex412

Car navigation system ex413

Satellite ex410

Antenna ex406

Monitor ex408

STB ex407

Television ex401

Recorder ex420

ex421

ex422

SD

Cable ex405

Broadcast Station ex409